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The American Biology Teacher

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Cartoons and Simple Sketches as Visual Aids

MARY D. ROGICK
College of New Rochelle, New Rochelle, New York

Drawing is an ancient, interesting, vital and universally understood form of expression. From primitive man to modern intellectual, from the cradle to the grave, it has proved its indispensability. The devotion of our young (and also of the older) public to comic strips, cartoons and picture books is proof enough of its appeal. That busy executives, professional and business men often resort to hastily sketched figures, diagrams, designs, maps, directions, etc., as a means of expressing themselves most clearly, economically and forcefully attests to the fact that this mode of expression is very valuable indeed, especially when we realize that many of these men have no more artistic ability nor art training than the average teacher or high school pupil.

In the schools, the art courses and the biology laboratory are or used to be the two strongholds of drawing. However, sketching is adaptable to any course in the curriculum. Not all the drawings should be done only by the pupil,—the teacher should do a great deal also, using sketching as a tool or means of explaining complicated situations, occurrences, processes, experiments, cycles, structures, progression, development, directions, important features, etc., in the shortest possible time, with the greatest simplicity, interest and emphasis.

Sketching may be of temporary or of permanent nature. Temporary drawings are those which the teacher draws on the blackboard during the recitation period to illustrate more clearly a certain point or subject under discussion. Permanent drawings are those made in more lasting form, as ink or colored pencil work, stencil or hektograph diagrams, cartoons, anatomical or similar drawings, clippings from various sources, framed demonstration material which is a combination of drawings and actual specimens (as life cycle mounts), and finally,

explanatory illustrative material accompanying exhibits or demonstrations. In the construction of some of these permanent preparations the teacher and pupil could cooperate artistically to mutual advantage.

A teacher need not be an artist to make adequate, useful blackboard drawings, action diagrams, cartoons, life cycle sketches, etc., but he does need clear and definite ideas. Sure knowledge of his topic and proper planning toward diagramming it will amply compensate for lack of drawing technique or so-called artistic ability. He must know exactly and surely what he wants to put across and what steps he will illustrate. All blackboard drawings (except those which are made "extemporaneously" to clarify some idea which arises unexpectedly during class discussion) should be carefully planned and sketched in the instructor's lesson plan or on loose-leaf paper, in advance of the period during which they will be executed for student amusement and edification. Blackboard drawings need not be elaborate, in fact, the simple line or skeleton action figures are often most amusing, thoroughly adequate and easy to follow. They should be action pictures, whenever possible, since this type seems more interesting than ordinary structural, anatomical, detailed figures.

One unaccustomed to implementing his teaching with blackboard action diagrams may find it a little difficult at first. However, by practice, he can soon apply the technique with good results. He can practice by taking some biological experiment, diagramming the apparatus and live material used, then illustrating the result. Other ideas which would furnish excellent practice material would be genetics problems, embryological or growth stages, progressive dissection directions, life histories of some organism. In this last case, one could picture the habitat, the pertinent ecological and biotic factors therein, the hosts or transmitting agents (if a disease or parasite is being studied). Science magazines, workbooks, hygiene, first aid, parasitology and biology texts would furnish many ideas.

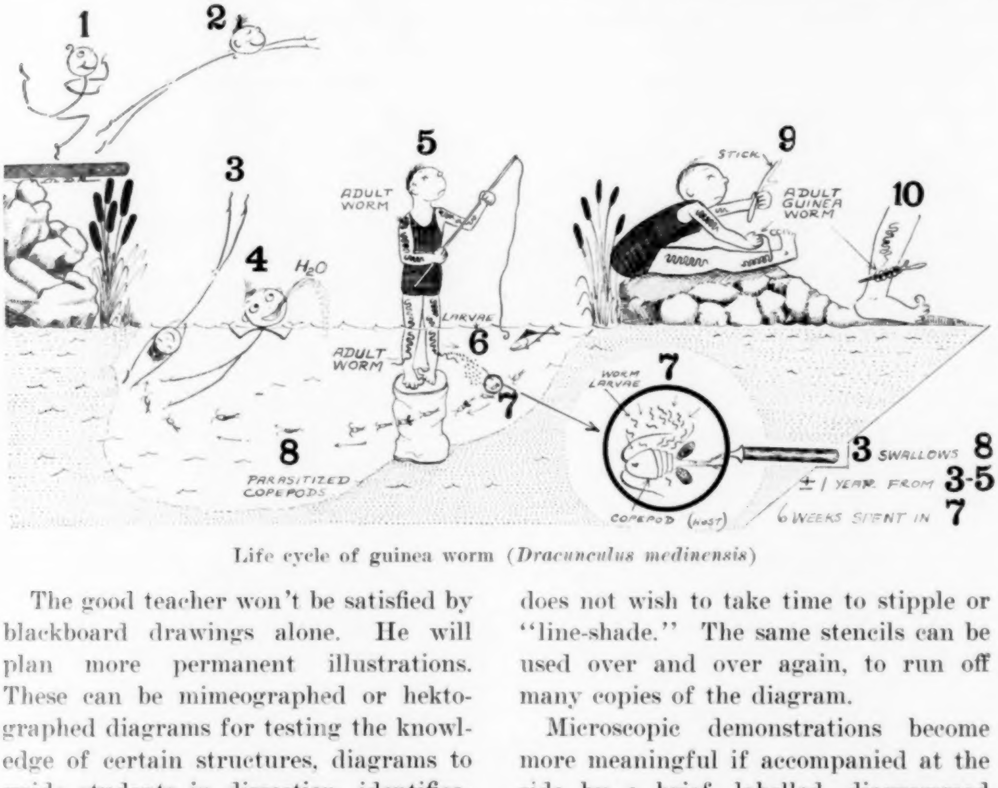
It is necessary to talk or give explanations while drawing on the board. For example, make a statement, draw the few lines which carry out the idea of that statement, then, explain the next step, make a few more sketches, etc. Making a few lines at a time and explaining as one goes will give the students a clue as to what is coming next, will preserve the continuity of the lesson and will give them ample time to copy the diagrams in their notebooks, should they so desire. While the instructor is explaining the sketches he must turn his face toward the class, otherwise some will fail to hear.

The sketches should be clearly visible to the farthest corners of the room. Using the broad side of a small piece of chalk or using brightly colored crayons will give excellent results. Erasures are to be avoided like the plague, regardless of how poor the drawings look. Frequent erasures and retouches of simple board diagrams set a bad example, show indecision, are confusing and are an admission of bad judgment. Lines should be made with a swing of the whole arm, not by wrist and elbow action alone. Numbering each figure or stage helps in keeping track of it and teaches the children some degree of system and orderliness. In making anatomical or morphological sketches the students should be shown the exact location, proportion, relation or respect of the structure to the whole organism, even if it takes a series of sketches to show that. In depicting life histories of organisms it is always advisable to sketch in a minimum of back-

ground so that the students will see the cycle in relation to the habitat and environment. However, one must never waste time on non-essentials and very fancy drawings when simple ones will serve as well.

Direct training in observation and clear thinking is furnished by such graphic presentation. It also encourages attentiveness, interest and a better teacher-pupil relationship, especially if the instructor has a sense of humor and expresses it in his sketches or explanations.

some of the outstanding and especially noteworthy exhibits or features is very suitable. The writer's students have found such plans most useful. Another good idea would be to carefully diagram some part of the school grounds, indicating in detail the types of trees, shrubs, plants or flower beds found there. In cutting stencils or hektograph forms good results and fine lines may be obtained by using dissecting or darning needles instead of a stylus. Some companies provide shading sheets which will enable one to shade on a stencil if he



Life cycle of guinea worm (*Dracunculus medinensis*)

The good teacher won't be satisfied by blackboard drawings alone. He will plan more permanent illustrations. These can be mimeographed or hektographed diagrams for testing the knowledge of certain structures, diagrams to guide students in dissection, identification, or on field trips. For outdoor field trips, sketches of the general route to be travelled and of things to be observed along the way are valuable and often most interesting to the pupils. For indoor field trips (as to museums or buildings) a floor plan diagram indicating

does not wish to take time to stipple or "line-shade." The same stencils can be used over and over again, to run off many copies of the diagram.

Microscopic demonstrations become more meaningful if accompanied at the side by a brief, labelled, diagrammed explanation. If the demonstrations are of permanent nature (prepared slides or specimens) the explanatory card and diagram can be filed away for use at some future date. One of the biological supply companies has prepared such combination demonstration slides and

explanatory diagrammed cards.

Homemade sketches and cartoons or drawings of any teaching value should be filed away for future use, preferably in some loose-leaf form, so that they may be easily extracted when needed. To them may be added similar (printed) illustrative material obtained from magazines, pamphlets, posters, etc.

Artistic ability is a great asset which should be utilized. If a biology teacher does not have it he should at least make a definite attempt to develop to the fullest such ability as he does possess.

EXPLANATION OF ACCOMPANYING DIAGRAMS

The accompanying series of diagrams illustrating part of the life cycle of *Dracunculus medinensis*, the guinea worm or "fiery serpent" shows a combination of techniques and purposes.

Figures 1, 2, 3 and 4 are action figures. Figure 7 is shown in two sizes, one small and the other supposedly much enlarged. Habitat is quite overstressed but improves the appearance of the diagram. Shading is done by 4 methods: stippling (ground), solid color (the cat-tails), cross-hatching (bathing suit) and by parallel lines (some of the rocks).

The diagrams illustrate the method of transmission of the parasite, the mode of acquisition, the hosts parasitized and the method of extraction. For the worm's itinerary inside man's body another (internal) detailed diagram would be necessary. Any good parasitology text would provide the missing data.

Science on Display

ADDISON LEE
Austin High School, Austin, Texas

Modern times demand appeal in everything—even in the school curriculum. If science courses are to be made interesting and appealing; then put science on display. Not only do we recognize that our science courses are to be made practical, informational, and worthwhile for the student, but also that we should consider the appeal which it has for the student. Fundamentally, science has appeal for youth. Visual instruction has done much to broaden this appeal. Science displays make an important contribution in this connection. They are also important in presentation of information and instruction to science students, other students, and the community.

Where can the science display be arranged? Even the bulletin board may be used for this purpose. It is helpful if the bottom of the board can be supplied with a rail of some sort. Shelves, cabinets, or a table may be used. Regular glass display cases, of course, may always be used effectively. Several years ago, the Biological Science Department of the Austin High School secured several used show cases. The descriptions given herein are based on displays in these cases; however, many of the ideas can be modified for use with other facilities.

The responsibility for arranging science displays can be shared by the science classes, science clubs, and teachers.

It does not necessarily take a display

artist to arrange an interesting and attractive display on science. A good science display should be:

(1) Well organized and carefully planned.

(2) Meaningful. It should carry a message which should be clear and concise.

(3) Accurate.

(4) Neat and artistic.

(5) Timely, dynamic, and appealing.

(6) Frequently changed.

The organization and planning of the display is very important. It is usually wise, after selecting a timely subject, to make a list of the things needed and a rough sketch of the arrangement. All of the copy for the cards should be written out. Each display should carry a single theme or center around a single idea. Many museum jars in a case with no explanations do no teaching, but if these are selected with a certain idea in mind, and clear and concise copy is written to explain this idea, then teaching is accomplished. There is a tendency to use the inability to do lettering as an excuse for failure to provide cards with copy explaining the display. However, some student or teacher is usually available who can do the lettering. In any case, inexpensive stamp lettering sets in different sizes may be obtained from the dime store or toy store. With these anyone can do a very satisfactory job of lettering. Also cut-out wooden block letter sets can be obtained.

What should be the subjects of the science displays? One of the most interesting displays which we have worked out is based on the idea made popular by Robert Ripley—"Believe It or Not." It included an illustration of a variety of common misconceptions, and was designed to correct them. Some of these used were: (1) The horned toad is a lizard, (2) bacteria are plants, (3) sponges are animals, (4) malaria is not caused by mosquitoes, but is caused by a protozoan, (5) the appleworm is not a worm, but a larvae, (6) bats are not birds, but mammals, (7) a whale is not a fish but a mammal, (8) spiders are not insects, (9) Spanish moss is not moss, etc.

"Biology's Tool—for exploring into the world of things too small to see—The Microscope" was the copy used to express the idea of a display on the microscope. The Bausch & Lomb picture of Leeuwenhoek and his first microscope was placed in the center of the case. Other items used in the display included a compound microscope, a dissecting binocular, a hand lens, a replica of Leeuwenhoek's first microscope, a fountain pen microscope, and a wire loop which, with a drop of water, makes a simple hand made microscope.

Another effective display was worked out on "Bugs, and How to Kill 'em." Large colored pictures of a number of insect pests, which were used to advertise Gulfspray, were obtained from a filling station and mounted on cardboard. These together with samples of contact and stomach poisons were arranged in the display. A toy airplane, a spray gun, and bellows (to illustrate the methods of application) completed the display.

It is obvious, of course, that many ideas for these exhibits will originate from the subject matter in the science class. We have prepared various displays on fossils, birds, vitamins, Luther Burbank, fish, patent medicines, bones, reptiles, etc. Trot out all the skeletons and skulls you have in the department. You can make an exhibit that will surely get attention. Your local grocery store can supply you with any number of samples illustrating the work of Luther Burbank. Find his picture in a book somewhere to place in the exhibit. If you

prepare an exhibit on patent medicines, obtain free reports from the American Medical Association and place these together with advertisements of products mentioned in the exhibit. Also use empty cartons or bottles of the products in the display. A large card in the center of our display carried the message "Truth about Patent Medicines."

Displays can frequently be used to illustrate work done by students. Perhaps they have made some models or have prepared some projects which make desirable displays. The display case can be used to promote and advertise any science awards which are given in your school. They can be used to illustrate participation of students in Junior Academy of Science Activities and to promote the interest in work of this type.

Just before the period in which students sign up for classes it is sometimes effective to work out a display briefly illustrating the various courses in science offered in your school. Select some models, charts, or appropriate equipment to be placed with a card which briefly explains the course.

It is often a good idea to plan displays to be appropriate for a certain season. For example, just before Easter obtain an Easter lily for your display case. Include in this display some scientific facts about the lily, such as its technical name, growth habits, propagation, cultivation; and mention some plants closely related to it. When the Texas bluebonnets were in bloom one season, we worked out an attractive display around the idea "Know Your Texas Flower—the Bluebonnet." Vases of the flowers were arranged in the form of a star and information concerning the classification, species, etc. was included. Books from the library can be used in many exhibits of these types. It will help to encourage students to use them. Another effective seasonal exhibit which we usually arrange centers around the idea "Native Shrubs for Christmas Cheer." Sprigs of many of these shrubs are collected, labeled, and arranged into an attractive and informational exhibit.

Try a series of exhibits on some given subject. A zoology class in our school worked out a series based on Hegner's "The Parade of the Animal Kingdom." A card bearing this title was used for all of the units, each of which illustrated a single phylum with pictures, museum mounts, and in some cases live animals.

Another series used was based on free bulletins from the State Public Health Department. A large number of these were obtained and assorted into groups for exhibition. One of these groups was on exercise. The card with the message read "Exercise—A Fundamental Factor of Good Health—good physical bodies help us to do anything we do better."

Sometimes a "How to Make" series of displays are helpful and interesting. Illustrate with a series of steps how to make a home museum mount, a home aquarium, or how to prepare a herbarium at home, and numerous others.

Often complete exhibits ready for display can be obtained from various companies in advertising the scientific preparation for certain materials. Some of these which we have used were on the Soy Bean, the Story of Corn, and the preparation of Photographic Material.

Finding a subject for display or an exhibit is not a problem. Subjects are very numerous. A little planning, organization, and practice will develop your ability to make and arrange effective science displays. Put your science on display literally. It teaches, and is an effective way to help develop the interest and study of science in the world today and for the world of tomorrow.

Termites: In Class—Under Glass

W. E. McCAULEY
Mgr. Insecticide Division, Velsicol Corporation, Chicago[1]

Imagine it! The cause of Charlie McCarthy's biggest bugaboo in your classroom. Would that stimulate your students' interest? Might it not even bring a few of the non-science students trooping into your laboratory for a squint at those "terrible termites," frequently referred to in the daily press. I believe you will even find some of your fellow staff members coming 'round for a peek at those lowly hewers of wood. It's not beyond the realm of possibility that the members of the school board may be interested in them. Certainly a parent-teachers' group would be delighted with an opportunity to familiarize itself with termites, especially if you teach in an area where every third house is likely to be infested by these "timber-tasters."

Here, I believe, is an opportunity for you teachers of biology to stimulate your students' interest and simultaneously offer your community a practical lesson in science which should help to offset the accusation sometimes heard that science is too abstract or lacking in useful practical information. This is one time is seems that you may kill two birds with one stone.

Much has been written about termites, much that would lead us to believe that the interesting species are to be found only in the tropics. It is true that the habits of tropical termites make them more grotesque, and it is unfortunate that through popular literature the habits of tropical forms are credited to our native species. Dr. T. E. Snyder makes the following statement, however, concerning our native forms: "Our termites when carefully studied do not need to have their habits of living 'dressed up.' "[2] Actually there is yet much to learn about our own native species.

Termites, where they are available, are quite easily transferred to the laboratory under glass, where they are certain to be watched with interest. A group of these insects represents a very highly specialized type of social life among the hexapods. The most common species in the north central states is *Reticulitermes flavipes.* If completely representative, one of these colonies will contain several forms of termites. Most common are the workers, a sterile caste. Another sterile group, and relatively unimportant, is the soldier caste. The most interesting members of the group are the various reproductive castes, which should be represented by both sexes. At certain seasons of the year winged individuals should appear; other types will be present that are intermediate in appearance between the darkly pigmented, winged "flyers" and the dirty-white workers. Besides these adults, there may be eggs and various nymphal forms of the different castes. If the colony can be kept alive a few years, some of the parent forms both males and females may be observed in their greatly enlarged condition after having undergone post-adult growth.

For satisfactory observation-colonies, I have found rectangular battery jars

[1] Previously with the Illinois State Natural History Survey.

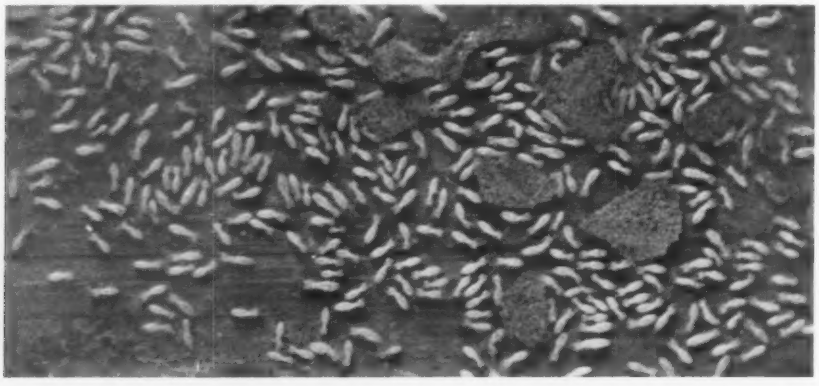
[2] *Our Enemy the Termite*, Comstock Pub. Co., 1935.

simple to use. A specimen of susceptible wood such as yellow pine (coarse grain preferable) is soaked in distilled water overnight and then cut down to fit loosely into the battery jar, and should be wedged firmly with small wooden pegs to avoid subsequent crushing as the jar is handled. The colony is now ready for inhabitants. Several hundred freshly collected termites (termites are easily obtained from infested wood without soil), should be separated from all soil and debris and added to the mount without crushing or injury. (Cellophane is ideal for handling termites, as they slide readily from it.) A few folds of moist paper toweling at one end of the wood block makes an ideal cushion and feeding medium upon which to get the termites started. A glass lid is then secured with transparent cellulose tape, and the colony is ready for use. A few drops of distilled water every week or so are all that is needed to maintain this very interesting laboratory exhibit. The jar must not be allowed to remain in direct sunlight as this usually results in death of the termites. Such a colony is obviously not pedigreed, but because of difficulties involved in starting with only the reproductive forms, I suggest starting with a "wild" random group. Usually some young reproductives will

These are the tell-tale tubular tunnels through which termites travel to traverse the territory twixt the terra firma and the tasty timbers.

be present. If the colony is started in the early spring, mature reproductives should appear in a few weeks.

Not to be forgotten is the unique relationship between the termites and the microscopic protozoa, these tiny organisms which make it possible for their hosts to survive on a diet of cellulose. The gut of a single termite from your colony should furnish much material for very interesting slides when these lowly forms are being studied, as in the intes-



Termites at work under glass. Those shown are mostly workers.

tines of most termites is a living fauna and flora of wide diversity and present in unbelievable numbers. Because they are of such scientific interest a colony is justified; add to that the practical value such a living mount can contribute to your work, and there is little more to be said.

A colony of this type in the classroom may not fit directly into your teaching outline, but it will prove to be one of the most interesting "life exhibits" in your laboratory. Teachers looking for ideas for Junior Academy of Science exhibits have an answer ready made.

Because of the dozens of gymnasiums or other school structures which are damaged by termites annually, and because much of such damage could be avoided by early recognition of the problem, your little colony of termites might make you a very important member of the faculty at an opportune time. It has always been rather amazing to me how totally absent the biology teacher and the science classes are when I am called upon to examine infested buildings and discuss termite control before various high school officials where damage has actually been done by these insects, often to the tune of a new gymnasium floor. Should the biology teacher not be an interested party where termites are involved?

Perhaps Charlie worries a bit too much about termites, but might it not be a wise action for you to familiarize your students with these pests?

Plaster Casts as a Biology Project

DEMPSEY J. SNOW
Garfield Junior High School, Johnstown, Pennsylvania

A valuable activity for the artistically inclined biology student is the making of plaster of Paris casts. Not only is it valuable from the instructional standpoint, but it will also result in the building up of permanent visual material for the classroom.

The materials needed are inexpensive. Five pounds of modeling clay, a sheet of galvanized iron (#26 gauge), plaster of Paris, strips of wood, varnish, and several small cans of paint of different colors should be sufficient. Modeling tools may be made from strips of wood as they are needed. The art teacher may be able to furnish the modeling clay, or it may be bought from any dealer in art materials.

There are four steps to the process: modeling, casting the negative or mold, casting the positive, and painting the completed cast. Illustrations in textbooks may be used as guides for the modeling.

Fasten the sheet of galvanized iron to a drawing board by means of thumb tacks around the edge. The head of the tack keeps the metal firmly fixed to the board. If the figure to be modeled is the cell, roughly sketch its outline on the metal. Then, with modeling clay, build up the area within this outline to a height of about one-half inch. Add the cell wall, being careful that you keep the sides of the cell wall tapering toward the top. If any part of the model tapers toward the sheet of metal, it will be impossible to separate the positive and the negative. The entire model should be carefully checked for this condition before the cast is made. After the cell wall has been completed, add the other structures you

wish to show. If a piece of modeling clay is rolled into a ball and then cut in half, one of the halves may be used as the nucleus. The granular appearance of the cytoplasm may be shown by pressing a piece of coarse sandpaper into the clay.

After the modeling is completed (Fig. 1) and has been checked to make sure the casts will not key together, you are ready for the next step—casting the mold or negative.

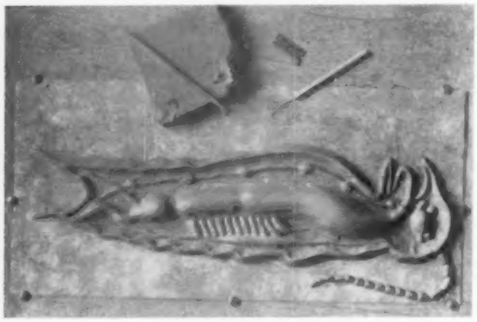


FIG. 1. Modeling with clay.

Remove the thumbtacks and, with four strips of wood, construct a frame around the edges of the metal sheet. Use strips of any convenient thickness and of about four inches in width. When nailed together and placed around the sheet of metal, they will provide a form deep enough for the average cast. The joints of the form may be sealed with modeling clay to prevent the plaster of Paris from leaking out.

Mix the plaster of Paris and water to a pouring consistency, and pour the mixture into the form so as to completely cover the model. A large mixing bowl or battery jar is ideal for the mixing. Always stir the plaster of Paris into the water. Try to estimate the quantity of mixture needed, so it will not be necessary to make a second "batch." Two pourings will result in a seam that may give trouble later. Salt may be added to the mixture to speed up the hardening, while the addition of baking soda will slow it.

Allow this cast to stand over night. Remove the form, and lift the cast from the modeling clay. Look for evidences of "keying." If found, they may be remedied with modeling clay or by scraping with a scalpel. The clay model may now be torn down.

The third step is the casting of the positive (Fig. 2). Place the negative face up on the sheet of metal. Re-nail the wood frame, and fit it around the negative, again making a casting form, and seal the joints as before. Then grease the inside of the negative with thin cup grease. Be careful not to lose any detail by the use of too much grease. Excess may be removed by means of a clean, stiff-bristled paint brush. Mix another "batch" of plaster of Paris, and fill the form to a depth of about three fourths of an inch above the level of the face of the negative. This will form the base of the completed plaque. If you wish you may reenforce the cast by embedding wire in the plaster of Paris. Again let it stand over night; remove the frame, and pull the positive and negative apart. Try to avoid prying them apart, as this always results in marking the cast.

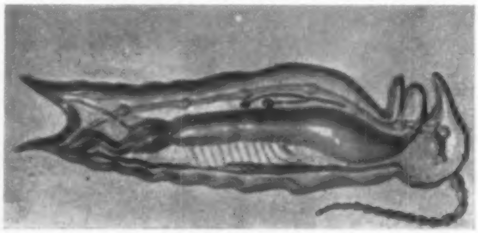


FIG. 2. Completed model in plaster. (Gastric caecae added later.)

The final task is painting, but this can only be done after the grease has been removed with a cloth moistened with turpentine. If the grease is not removed, the paint will not stick. Prime the entire

face and edges with varnish. Since the plaster of Paris is not completely dry, it is well to leave the back unpainted. Further evaporation will take place here. Use any ready-mixed oil color. Small cans may be bought at the local "5 and 10." Use your own judgment in the selection of colors, keeping in mind that you want contrast so as to make the various structures distinct. Labels may be painted right on the cast, or you may prefer to leave it unlabeled. After the paint is dry, give it a coat of varnish. This will give the completed model a uniform gloss and make it easier to keep clean.

The cost of the grasshopper model pictured here was less than $2.50. This cost does not include the modeling clay, which may be used again.

VISUAL AIDS IN THE FARMINGTON HIGH SCHOOL

A science teaching experience of 13 years has convinced me that visual aids are essential to functional biology instruction. I have helped to build up in the Farmington High School a very substantial number of visual aids. The methods used in securing these aids are outlined herewith.

The cooperation of the school board was secured in order to build up a nucleus of materials. The manual training department provided an excellent cabinet for display purposes and helped to construct shelves about the room and one large flower box. A large bulletin board completed the room lay-out for display of biological visual aids.

Except for the nucleus of materials supplied by the school board, the students made all other additions. Their cooperation was secured by constant encouragement to seek out living specimens and a requirement for completion of an individual project each semester. The show case is kept filled with results of student labor and imagination. Excellent mounted skeletons of a frog, squirrel, fish, and cat adorn the museum case. Life histories of insects have been prepared in Riker Mounts. Fresh and salt water aquaria are student-supervised.

John A. Hangen,
Farmington High School,
Unionville, Connecticut.

EVANDER PRODUCES AUDIO-VISUAL AIDS AT SCHOOL

Mr. David Schneider writes that the talent of the Evander Childs High School Biology Department and Motion Picture Club has been combined to produce science movies at school. "The Importance of Milk in the Diet of White Rats," a kodachrome account of "Chick Embryology" are titles of the two most successful movies produced as yet. The latter movie won first prize at the American Institute's Cinema Show. These adept school movie producers are engaged at present in preparing films on school guidance, first aid, geological evidences of evolution, and certain biological processes.

During each year, one or more meetings of the E. C. H. S. Biology Department are devoted to audio-visual aids. New objective materials, experiments, and new films are demonstrated and discussed. Committees are assigned to evaluate old films. The biology department urges other teachers to share with the biology classes in witnessing certain films.

President's Page

We are teachers of Biology. But we are also teachers of students. In some way we should get the two together. Not many of us take a textbook and assign certain pages, or a certain subject to be studied and recited upon in class the next day. That method should put biological facts into the student's mind and we would have accomplished one objective of teaching biology, it is true, but how long will those facts remain in the student's mind and what have we done to the mind itself? Have we given the individual a chance to develop under our guidance, or are we trying to do the developing for him?

On the other hand, we can study all the fields of biology and we can master, in our minds, all the best methods of teaching and still not reach the student with our subject. With all the schooling and all the degrees that we may have there is nothing that can take the place of a real enthusiasm for teaching biology. If the teacher does not bubble over, he cannot expect the students to do so. The fire is too cold. During the summer we can use a fan to keep us cool, but during the winter we had better use it to fan those coals of interest into a hot flame. I couldn't count the times that questions from interested students have stumped me and it is very easy to let the matter drop right there. But the teacher who is teaching for more than a living, meager though it is, will never let a student's interest die for want of an answer. Then let us live our enthusiasm during the twenty-four hours of the day and undoubtedly some of it will "take" in our students.

I believe that every president has asked our members what they want from the organization. I shall not be an exception. Do you like the Journal as it is? Do you think we give too much space to certain things and not enough to others? Would you like to have us publish, as separate pamphlets for sale, such things as teaching aids, laboratory techniques, or biology club programs? Would you like to have a question and answer service, or an exchange service? Then, on bended knee, I beg of you to write and let me know what you would like to receive from your National Association! This cannot carry a promise that your wish can be fulfilled, but does say that we will give it all the consideration possible. Thank you, very much.

H. A. S.

REGIONAL MEETINGS

If the Chicago meeting may be taken as an indication of the success of regional meetings, then let's have more of them. It was a carefully planned meeting with an excellent program. The Chicago group is certainly to be congratulated on it.

Our next meeting is the National one in Dallas, December 29. It looks promising with such speakers as Dr. J. M. Coleman, of the Texas State Board of Health; Professor Rudolph Bennitt, University of Missouri; Dr. Asa C. Chandler, Rice Institute; Dr. Oscar Riddle, Carnegie Institution, and several other well known speakers. If you have not done so, be sure to make your reservations at the Hotel Jefferson. Since we are not the only association using that hotel as our headquarters we suggest you get in touch with them soon.

Full details of the Dallas meeting will appear in our December issue.

H. A. S.

OUR OPPORTUNITY AS BIOLOGISTS

Largely as a result of the applications of science, the population of the world has increased five fold during the last three centuries. In the past century alone our species has doubled its numbers. The present world-wide turmoil is basically a biological problem. The development of a higher civilization than we have yet known depends upon the application of the scientific method to yet wider fields of human activities. Numbers alone are not enough to insure the continued success of a species: quality also is important. In the making of a better and a happier population we as teachers of the biological sciences are destined to play an indispensable and increasingly important role. It is our privilege and our duty to prepare ourselves in every way we can to meet this great responsibility. Membership in a professional society such as *The National Association of Biology Teachers* is one of the ways of stimulating our growth in knowledge and power. If you are not already a paid-up member will you not at once send in your dues. (Membership blank on page 72.)

VISUAL AIDS: AN EDITORIAL

Certain of the specialists in visual education concern themselves greatly with the development of proofs for the educational value of movies, slides, models, and other forms of visual aids. It would seem from perusal of educational literature that the value of visual aids in education has been established for many years. For this reason, the committee on visual aids of the N.A.B.T. sought to secure information concerning (1) preparation of inexpensive visual aids, (2) proper manipulation of visual aid devices, and (3) new visual instruction materials and devices.

The committee heartily endorses the more extensive use of visual instruction by biology teachers. It is important, however, that we keep in mind the limitations of this aid to education. Without proper pre-conditioning of the student mind and effective follow-up activities, the value of any visual instruction is reduced markedly. Instruction should not become so completely visualized as to eliminate work, thought, and imagination by the student. We should be on guard to prevent confusion of visual instruction with pupil entertainment. If these pitfalls are avoided, visual aids will promote economy of time in learning and enrich and vitalize the biological science offering to the students of America.

WILLIAM A. BETTS, *Chairman*
Committee on Visual Aids.

CHICAGO BIOLOGY ROUND TABLE

The Chicago Biology Round Table held its first meeting of the year 1941–1942 on October 3, at the Piccadilly Restaurant, 410 South Michigan Avenue.

Dr. Ralph Buchsbaum of the University of Chicago gave an interesting illustrated account of "A Summer on Barro Colorado Island, Panama."

At the next regular meeting, December 12, Mr. Yaeger, State Forester, will speak on "Renewable Resources of the State." On November 21–22 the North Central Association of Science and Mathematics Teachers meets in Chicago at the Stevens Hotel. An interesting program is scheduled in the Biology Section.

REPORT ON THE REGIONAL MEETING OF THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS HELD IN CHICAGO, OCTOBER 11, 1941

The largest meeting of *The National Association of Biology Teachers* ever held was on Saturday, October 11, at the Stevens Hotel in Chicago, when four hundred and fifty biology teachers of the Midwest assembled at their regional meeting. One hundred and fifty-five of these teachers attended the evening banquet. This meeting, from the program, the exhibits, and the banquet angle was outstanding. All speakers were authorities in their respective fields, so that they were able to give their audience material that was appreciated and enjoyed to the fullest. It renewed in the biologist the vitalness of his subject and its impotrance in the education of mankind for a healthier, happier world in which to live.

Represented at this meeting were: The Chicago Biology Round Table; The Illinois Biology Teachers Association; The Northern Indiana Biology Teachers Association; The Detroit Biology Club; The Biology Section of the Wisconsin State Teachers Association; Catholic Organizations from Illinois, Indiana, Wisconsin, and Minnesota. Telegrams and letters were received from: Superintendent Johnson, Chicago Public Schools; Charles C. Herbst, Beverly Hills High School, Beverly Hills, California; Dr. Oscar Riddle, Carnegie Institution, Cold Spring Harbor, Long Island; Dr. D. F. Miller, Ohio State University, Columbus, Ohio; Malcolm D. Campbell, Dorchester High School for Boys, Boston, Massachusetts; and the immediate past-president, Dr. George W. Jeffers, State Teachers College, Farmville, Virginia.

HELEN TROWBRIDGE,
Regional Chairman.

STUDENTS ARE ELIGIBLE FOR MEMBERSHIP

To the Editor:

I am a student of Central Missouri State Teachers College and I am planning to teach biology after I graduate. I find THE AMERICAN BIOLOGY TEACHER very interesting and quite helpful. I am under the impression, however, that subscriptions to the magazine are issued only to members who must be biology teachers. I should like to subscribe to the magazine although I am not yet a teacher. Will it be possible for me to do this?

Forrest F. Stevenson
Warrensburg, Missouri.

The Constitution of *The National Association of Biology Teachers* provides that membership shall be open to "all who are interested in the teaching of biological science." This includes teachers, students, and others. Many students have already joined. We are glad to see young people take this progressive step in their professional career. Teachers who are members can do a valuable service to themselves and their students by advertising the advantages of membership in a nation-wide professional society such as ours. The low cost of membership, including a monthly journal, should make it possible for many to join. We are sure that in no other way will the spending of one dollar bring greater returns in professional advancement. The association needs new members. Will you not help us to secure them?

A Working Model for the Demonstration of Endocrine Interrelationships

RICHARD J. BLANDAU
Arnold Laboratory, Brown University, Providence, Rhode Island

In view of the tremendous strides in endocrine gland physiology within the past two decades it is becoming increasingly difficult to effectively present the complex interrelationships of the activities of the various hormones.

In attempting to contrive some means whereby a hypothetical explanation of the endocrine interrelationships of the female reproductive system could be visually demonstrated, an apparatus was devised which, even though incomplete, proved to be useful. It may indicate to others possibilities for various similar demonstrations.

The demonstration may be assembled easily in any laboratory where glass and rubber tubing and some inexpensive jars are available.

The apparatus consists of a piece of fiberboard, 36 inches wide and 45 inches high, the surface of which was painted white. Diagrammatic drawings of the anterior lobe of the pituitary, ovaries, uterus, mammary glands and pelvis were made on stiff cardboard and painted, in outline, with show-card colors, Fig. 1. Holes, through which the glass tubing would pass, were drilled through the drawings and fiberboard. Lengths of glass tubing were so bent as to form connections between the various organs as the figure indicates. Rubber tubing was connected to the ends of the glass tubing, which were inserted through the drilled holes. One end of the tubing was attached to a pressure bottle containing a colored fluid and the other end put into an empty waste bottle.

Figure 2 shows a side view of the general arrangement of the pressure bottles containing the various colored fluids. Pressure for forcing the fluids through the tubing was obtained by the use of a rubber bulb, (B) and a control jar, (A).

When the chart was to be put into operation all of the glass tubes were drained and the fluid returned to the pressure bottles. The rubber stoppers were pushed down tightly and the rubber tubing leaving each jar was clamped with a Castaloy pinchcock. A small amount of pressure was built up and pinchcock No. 1 was removed. This allowed the colored fluid to pass through the first tubing, indicating the initiation of ovarian function due to the release of follicle stimulating hormone from the pituitary. The follicle stimulating factor stimulates the periodic development of the graafian follicles and secretion of theelin by the developing follicles.

Jar No. 1 was then clamped and pinchcock No. 2 was removed to indicate the activity of theelin. Theelin is essential for the development and maintenance of the gonadal accessories. It promotes endometrial proliferation and secretory activity of the serous glands of the uterus; it increases uterine and tubal contractility.

The development of the mammary duct system and the conditioning of the

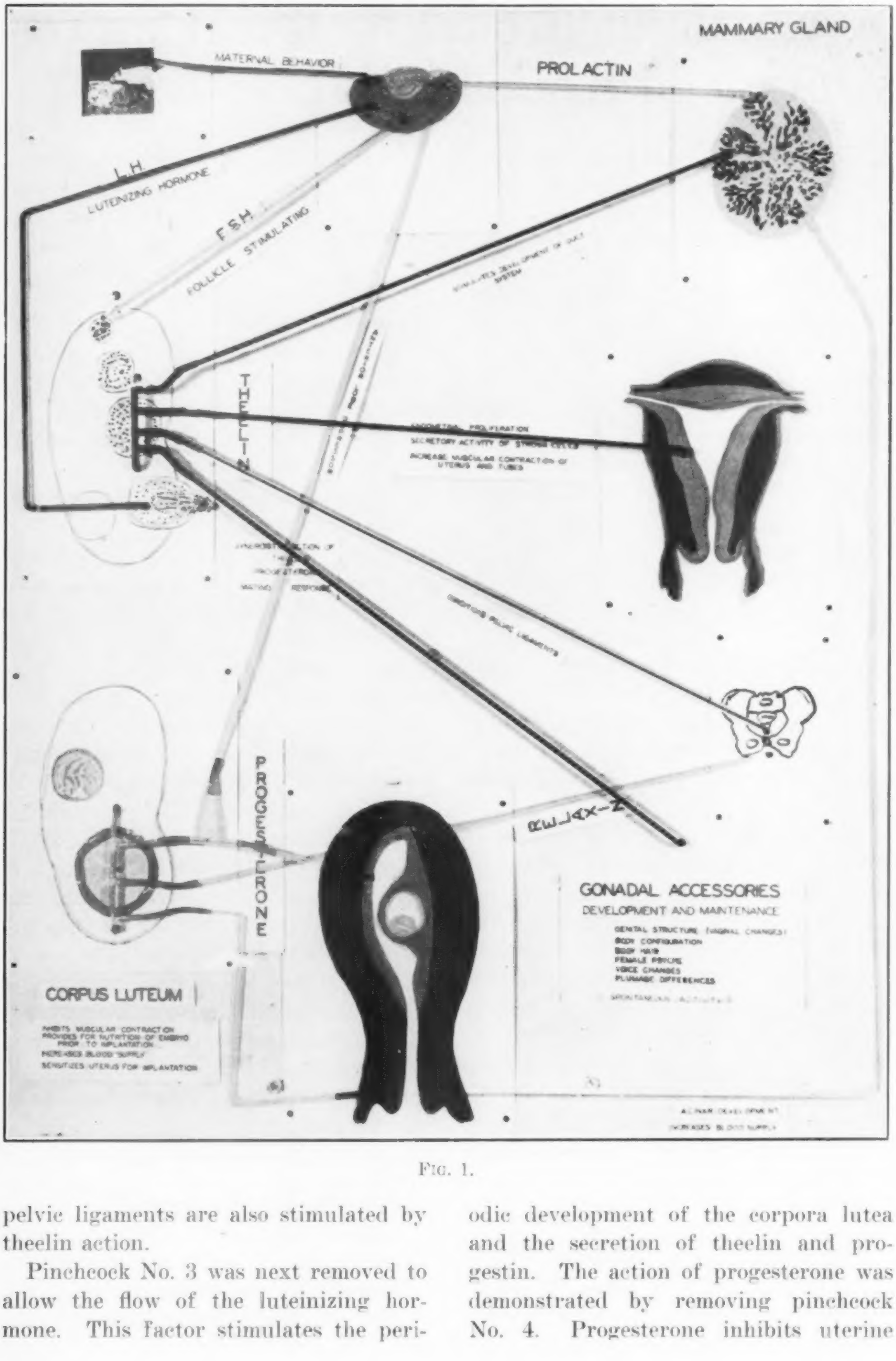


Fig. 1.

pelvic ligaments are also stimulated by theelin action.

Pinchcock No. 3 was next removed to allow the flow of the luteinizing hormone. This factor stimulates the periodic development of the corpora lutea and the secretion of theelin and progestin. The action of progesterone was demonstrated by removing pinchcock No. 4. Progesterone inhibits uterine

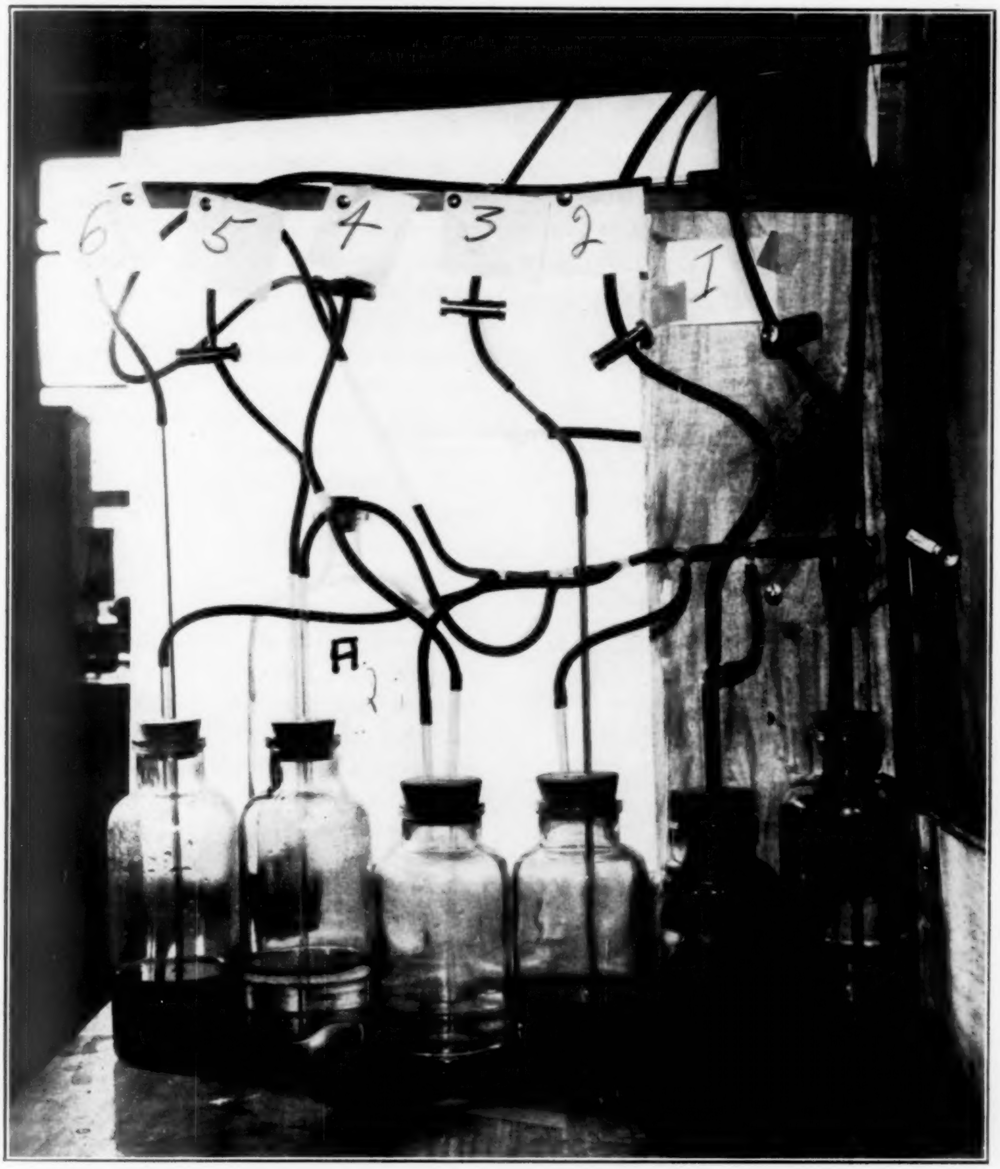


Fig. 2.

muscular contraction; provides nutrition for the ovum prior to implantation; increases the blood supply and sensitizes the uterus for implantation. In addition, it initiates acinar development in the mammary gland.

Another active substance secreted by the corpus luteum is Relaxin. This factor acts by completing the action initiated by theelin in relaxing the pelvic ligaments in certain mammals during pregnancy.

The removal of pinchcock No. 5 demonstrates the elaboration by the anterior pituitary of the lactogenic hormone which stimulates milk secretion by the

mammary glands.

Maternal behavior was demonstrated by the removal of pinchcock No. 6. Whether the anterior pituitary hormones are solely responsible for maternal behavior is to be questioned.

By the enlargement of the chart the activities of other factors of the anterior pituitary gland such as growth, diabetogenic and ketogenic hormones could be easily demonstrated.

THE OPAQUE PROJECTOR

An opaque projector is a device, which by means of a system of mirrors and lenses, casts upon a screen an enlarged image of pictures and objects which are not transparent. Improved models such as the Spencer delineascope, Bausch and Lomb balopticon and Leitz opaque projector, provide critical definition as well as high transmission of light, which means that the image is clear and the loss of light is much less than that suffered in the older models.

In most schools, the cost of equipment is an important item. When visual aids are considered, there are two costs: the initial cost, *i.e.,* the price paid for the projector; and the cost of the materials to be used. The initial cost of a good balopticon probably stands midway between that of an S.V.E. projector for miniature slides and film strips and that of a motion picture machine; but the material used for opaque projection is by far the cheapest and the easiest to procure. Today's magazines are excellent storehouses of illustrations, charts, maps and graphs which can be used so well in the classroom. The pages of the National Geographic, for instance, offer a wealth of pictorial reproductions covering many subjects and thus supply beautiful visual aids to classes in Biology and to many other classes as well. The problem of utilization of these helps is really one of organization, since the busy teacher is unable to use the material due to lack of time in which to sort it and storage space in which to preserve it.

To meet this difficulty, the writer suggests a series of cloth-bound boxes made in book form suitable for library shelves. These may be classified under fifty or more heads and alphabetically arranged. Teachers, then, may easily find suitable material and check it out as they do books. After having used this system for some time, teachers become picture conscious and are on the alert to pick up and preserve illustrative material, not only for their own department, but for others as well.

Some teachers may prefer to make a picture file for the Biology room. This will have a place for material pertaining to each unit of the course. Pictures will be arranged, not alphabetically, but in sequence. For example, all pictures, diagrams, charts, graphs, etc., relating to Protozoa will be filed together and in order. Sometimes, too, one finds material in text books which is excellent for projection. This cannot be filed but a card on which is typed the name of the book and the pages to be used, can be inserted in its proper place in the file. When the Protozoans are to be studied, the file is consulted and pictures, etc., relating to the day's lesson are selected and used. After class they are left on a table or placed on the bulletin board for student use.

There is great need for research to determine the effectiveness of the various types of visual aids. It is certain, however, that the use of an opaque projector in a Biology course is no more a guarantee of successful teaching, than is any other visual aid. The teacher must still teach, keeping in mind all the time that he is presenting the principles of life to

a group of real, live people upon whom what he says and what they see, is to make a lasting impression. The wise teacher will be extremely careful in his selection of pictures. Again, care must be taken that illustrative material does not become the end of instruction instead of the means. The class period is a time of hard work, not of entertainment. True, there is a definite increase in the effectiveness of an explanation if an illustration of the subject under discussion is on the screen. Seeing and hearing together make for better understanding and retention. But here, too, there are limitations. Flat pictures lack depth and enlarged pictures are not true to size and thus, while the projected illustration does help the student to get a proper initial concept, the teacher must be prepared to give the approximate magnification of the actual object or have some familiar figure in the picture which will give an idea of the comparative size of the organism being studied. To illustrate: suppose a class is being introduced to the hydra. Exceptionally good material for opaque projection may be found in "Animals without Backbones" by Buchsbaum but the pictures are photomicrographs and unless the students see a live hydra beforehand, the initial concept is likely to be incorrect.

Perhaps the greatest disadvantage of the opaque projector is that the room used must be quite dark. Green, close-fitting shades on windows and transoms will take care of this so far as light is concerned but they do not take care of ventilation. Hence, unless the school has a ventilating system other than windows, darkening a room for a class period will entail considerable inconvenience. On dark days, however, windows situated behind the projector may be opened without serious effect upon the quality of projection.

In conclusion, it may be said that the value of any type of visual aid varies with the ability of the teacher who uses it. A good, ingenious teacher can accomplish a great deal with meager equipment while the indifferent teacher may fail in spite of the best equipment money can buy.

Sister M. Etienne,
*Mount Mercy Junior College,
Cedar Rapids, Iowa.*

LIVING SCIENTISTS AND LIVING LABORATORIES

There is an old Eastman classroom film on Luther Burbank in which the "plant wizard" is shown in a number of sequences. He inspects his wheat field, works at reaping his improved oats, demonstrates a group of spineless cacti (he even chews a piece), holds a leaf of giant rhubarb, and after a number of other activities, relaxes in his rocking chair on the porch of his home.

Although Burbank has been dead for a decade and a half, he still exists as a personality for the biology students who are fortunate enough to see this film. Without the motion picture, Burbank would be a name to these young people —as much a name as are any of the other men whose contributions are part of our curricular heritage.

How impressed are our students with Spallanzani, Dujardin or Schultze? They know of their scientific work, and can relate it to you in a sentence or two. But they have not the slightest idea of the dynamic individuals represented by the names. They must rely on a picture in the textbook and an item in the encyclopaedia for a measure of the man himself.

We all call for biographical reports in class to create a personality with whom the students can associate important sci-

entific concepts. We recognize the deadening effect of our instruction if we simply required the memorization of names out of a scientific Who's Who. We can easily imagine how valuable a motion picture showing a scientist in action would be.

It is unfortunate that Darwin lived before the day of the motion picture. Our mental image of him is limited to a long, gaunt figure in a black cloak, with a white beard, as pictured on the cover of Geoffrey West's recent biography, or to one or two other illustrations. His contemporary, Gregor Mendel, is just as stereotyped in the minds of many generations of students.

In this respect, biology teaching has received indirect assistance from Hollywood. The researches of Pasteur and Ehrlich have captured the imagination of movie moguls, and we have seen sumptuous production based on their work.

But must we rely on the services of professional actors and professional producers to vivify the great scientists who are still living today? Can we not make use of these men themselves, and show them at work? The student who peeks into the life of the scientist about whom he is studying, and sees him amid the actual plants and animals that were used in deriving some important concept, acquires an acquaintanceship that will long endure.

Roy Chapman Andrews and his expeditions to the Gobi desert become real to the student who can see the difficulties, the excavations and the discoveries, in the American Museum of Natural History film. We are overlooking a splendid opportunity by omitting other present-day figures. Already, many of them have been lost to us. Banting was killed early this year; Pavlov and de Vries died quite recently.

Would it not be possible to utilize our men of science in a motion picture project that would record their activities and their personalities? A film showing his contributions and featuring Thomas Hunt Morgan would be of distinct pedagogical value. Blakeslee's work with colchicine, and Stanley's researches on viruses, would provide further valuable material. Other subjects would suggest themselves in the course of construction of such a project.

In addition to providing students with personified images of scientists, it would also be desirable if their sphere of vicarious experiences with scientific subjects could be enlarged in another way. Few students have the opportunity of visiting scientific institutions or experiment stations.

Any number of such laboratories might suggest themselves as suitable for filming. A scenario could be developed for each so that it would fit in with one or more units of the course of study. For example, the following suggest themselves as a few of many possible institutions that might be used. The Boyce Thompson Institute with its many researches in plant physiology; the genetics and endocrine laboratories of the Carnegie Institution of Washington, at Cold Spring Harbor, Long Island; the Crocker Institute for Cancer Research, in New York City; the Rockefeller Institute for Medical Research, the Connecticut State College Experiment Station, where there are Ancon sheep and creeper fowl; other federal and state agricultural experiment stations; the Marine Biological Laboratories at Woods Hole, during the summer.

Even motion pictures of plants and animals that are not in the zoological and botanical gardens (or even in them!) would be desirable. How much do students know of living, animate organisms as the duck-bill platypus, whale,

giraffe, Brahman cattle, and kangaroo? We show films of protozoa and neglect these other organisms that are part of our classroom vocabulary, and often exist only in the students' imagination.

In the preparation of these films, it might be well to remember that they need not be the standard 300–400 feet in length. They may be very short, consuming only five minutes, and may be projected at the appropriate time in the course of a lesson.

If such classroom films can provide the student with an experiential basis for understanding what he is learning about, they will justify themselves as essential visual aids that should be part of every school's equipment.

MAURICE BLEIFELD,
High School of Science,
New York City.

DECORATING A CHRISTMAS TREE WITH PLANT AND ANIMAL SPECIMENS

It was with a great deal of interest and pleasure that I read the article in the December issue of the A.B.T. entitled "A Christmas Suggestion for the Biology Class." I immediately thought of a project which the biology students at Henderson Institute undertook, and which turned out rather successfully.

While the project itself was not original or new, it was new to the students in the three biology classes, and was undertaken very conscientiously and eagerly by them. The project was *decorating a Christmas tree with plant and animal specimens,* and we attempted to include as many original ideas as possible. Everything on the tree was either a plant or animal or parts of them, and it was interesting how many different specimens the students could think of and collected to deck the tree. Various colors of paints were added to many of the specimens to make them more attractive.

Following is a list of most of the specimens used:

1. Pine Needles.
2. Locusts (plant).
3. Popcorn.
4. Pine cones.
5. Holly berries.
6. Acorns.
7. Peanuts.
8. Peppers.
9. Pressed flowers.
10. Mistletoe.
11. Moss (Tillandsia).
12. Magnolia tree cones.
13. Dogwood berries.
14. Asparagus berries.
15. Running Cedar.
16. Leaves (various types).
17. Leaves (Sweet Gum for star).
18. Pods of dried beans and peas.
19. Corn (white, yellow & red).
20. Small gourds.
    (Other plant specimens as Cat-tail.)
21. Starfish.
22. Shark egg cases.
23. Terrapin shells.
24. Butterflies.
25. Moths.
26. Whelk egg cases.
27. Peacock feathers.
28. Insects.
29. Squirrel tails.
30. Sea shells (dozens of these were used—all shapes and colors).
31. Rabbit feet.
32. Teeth (extracted from jawbones of hogs after they were killed).
33. Very small stuffed animals (many other animal specimens may be used).

An attempt will not be made to discuss the detailed preparation of the tree; however, some of the ways will be pointed out in which the specimens were made more attractive. The locusts were painted with alternating bands (1–2 inches wide) of gold and green, green and silver, red and silver, white and red, while some were left their natural brown color, or were dotted with the abovementioned colors. Various colors and types of leaves had been collected and to some of them color was added. Red

leaves received more red paint, green and yellow more green and yellow paint respectively. The leaf of the sweet gum tree was painted silver and used to represent a star. One such large leaf was most attractively perched on the tip of the tree which reached the ceiling of the room. Some smaller such leaves were placed about on the tree.

The girls spent much time in stringing popcorn, holly berries and other red berries which were collected. After many strands had been made they were placed on the tree to coincide with the red and green Christmas ropes on our home Christmas trees. The cones of the magnoila tree were used, but unfortunately the red seeds had been expelled from the cones; so after painting the cones silver or gold the seed compartments were neatly stuffed with absorbent cotton on which two or three drops of red ink were added. This not only made the cone resume its natural appearance, but made it more attractive. Pine cones were tinted with brown, green, gold and silver. Long pine needles painted silver were used to represent icicles. Peanuts, acorns and other nuts were painted gold and silver; the leaves of the running cedar were painted silver.

All of the specimens did not need color added—in fact it probably would have made the tree too artificial if we had; yet the students agreed that the tree was the most beautifully decorated one they had seen, and far superior to those artificially decorated.

Many of the specimens have been stored away, so next year not so much time will be required for collecting and preparing the same specimens. The tree should be finished at least two days before school closes for the holidays. Our last two days were used for discussing the project and its practical value, as well as a discussion of some such topics as were listed in the December issue article. Many students attempted to decorate their trees at home using the same idea.

Paulus Clayton Taylor,
Hampton Institute,
Hampton, Virginia.

BIOLOGICAL OPPORTUNITIES IN RURAL HIGH SCHOOLS

The writer recently had occasion to visit the science department in a small, rural high school. The embarrassed biology teacher apologized profusely for his lack of teaching materials. "We just don't have any money for anything," he complained.

Perhaps this teacher was justified in his plaint. Nevertheless, no schools are better located than are the rural high schools so far as biology teaching is concerned. Farming is an occupation depending almost exclusively upon living things; the experiences of rural pupils should make city teachers envious. Only near-sighted teachers, steeped in academic tradition, could fail to see the many possibilities of the rural environment.

This writer once taught biology in a high school even smaller than the one mentioned in the first paragraph. Of money there was little; of teaching materials, more than could be used. These materials were usually brought in by the pupils themselves, but, once a tradition had been established, others in the community brought in specimens on their own initiative.

Most of the farmers butchered all or part of their meat supply during the winter months. Thus an ample supply of eyes, brains, lungs and other inedible portions was assured. The local butcher supplied other parts at a minimum rate.

One boy, whose father raised some thirty sows, made a valuable contribution to the school. He bred the sows at different times and kept records. Then at butchering time, he brought in the uteri. Not only did the school come to own a good set of pig embryos, but the pupils learned facts that could not have been learned from commercial specimens.

Victims of the minor tragedies of farm life were contributed. Pregnant cats, soon to be a nuisance, were sent on promise of a painless death. Rats caught in live traps were sent for execution. Once a part-term calf, still attached to the placenta, was brought in; another time, a part-term colt was made available.

Nearly all the boys trapped fur-bearing animals. They added the skulls of the carcasses to the collections. These skulls were invaluable for teaching some of the principles underlying classification. Once, a careful worker mounted a complete fox skeleton from one of these carcasses.

One should not conclude that the emphasis was upon morphology. Far from it. The school was located within five minutes walk of meadows, pastures, wet and dry woods, two streams, a ravine and an overgrown bog. Field work became an accepted thing rather than a novelty. To encourage field work still more, the school buses were available for trips to more distant localities.

The biology room was usually filled with interesting things brought in by pupils and their parents. One table was reserved for just such contributions, and there was an ample number of aquariums, terrariums and cages. One day the most interesting feature might be a flying squirrel killed by a woodchopper; another day interest might be centered on a huge water snake captured by a brave fourth grader; on another day it might be a bat captured by a feed dealer. The most popular, though unplanned, exhibit at one of the school fairs was a terrarium containing seven peepers singing for all they were worth. Grown-ups, who had never seen peepers but had always heard these spring harbingers, were fascinated.

So it was that the most discouraging feature was not lack of materials, but lack of time to take advantage of the superabundance of materials. One could never decide what to utilize and what to neglect; any one of the items might some day be of immeasurable value to a boy or girl about to spend his life among living things.

WALTER A. THURBER,
State Normal and Training School,
Cortland, New York.

FORMALIN FUMES NEUTRALIZED

Formaldehyde may be removed from preserved specimens by immersion of the specimens for 3 to 5 minutes in a solution consisting of 5.7% sodium bisulfite, $NaHSO_3$, and 3.8% sodium sulfite, Na_2SO_3 (both by weight), dissolved in tap water, according to W. B. Fort and H. C. Wilson, writing in *School Science and Mathematics* for June, 1941. They report that 20–30 liters of the solution will last a full semester in daily removal of formalin from specimens in use in a zoology class of 35 students. If the sodium bisulfite is too concentrated SO_2 gas will be evolved; adding sodium sulfite serves to prevent this. The solution is not a good preservative, as specimens left in it will become soft in a few days or weeks. Glazed crocks or glass containers should be used for the solution, since metal containers are acted upon by the chemicals.

Books

DOBZHANSKY, THEODOSIUS. *Genetics and the Origin of Species.* Second edition. Columbia University Press, New York. xviii + 446 pp. 1941. $4.25.

To most living biologists evolution as a *fact* is no longer regarded as debatable. All agree, however, that much remains to be learned about the *process* of evolution. This book is a very successful attempt to fit the great contributions of genetics, made during the past forty years, into an explanation of the mechanics of species formation. *Genetics and the Origin of Species* impresses the reviewer as the best book on evolution since Darwin's *Origin of Species*, and it may in fact be regarded as a supplement to that classic. The author, a leading contributor to research in this field, is a master of his subject; moreover, his skill as a writer of beautiful and concise English enables him, like Darwin, to make clear and interesting a difficult topic.

Dobzhansky is a leader in a group of biologists classed by some as neo-Darwinians, but, although he regards the theory of natural selection as of high validity, he clearly recognizes its limitations: species formation is regarded as a resultant of a complex interplay of factors, the pattern of which may vary from species to species. The aim of the author is to fairly evaluate these factors. Logic and sound judgment are evident throughout the book.

The chapter headings are: Organic Diversity; Gene Mutation; Mutation as a Basis for Racial and Specific Differences; Chromosomal Changes; Variation in Natural Populations; Selection; Polyploidy; Isolating Mechanisms; Hybrid Sterility; Patterns of Evolution; Species as Natural Units.

This work, unlike Darwin's, is fully documented, with a literature list of 45 pages. There is an adequate index. As a text for a course in evolution and as a reference book for the biologist the first edition deservedly met with high favor. The second edition has been enlarged and improved.

E. C. C.

HOOGSTRAAL, HARRY. *Insects and Their Stories.* Thomas Y. Crowell Co., New York. 144 pp. 1941. $2.00.

Mr. Hoogstraal has prepared a fine reference on insects, and there are excellent full page pictures in black and white by Melvin Martinson of each insect described. The 144 large pages $9\frac{1}{2} \times 7\frac{1}{2}$ describe the life history and give interesting facts about forty-six insects that are common in our northern states. The book is divided into five sections: 1. Introduction, 2. Insects of the House, describing three insects, 3. Insects of the Garden, twenty-nine insects, 4. Insects of the Trees and Woods, eight insects, and 5. Insects In or near the Water, six insects. There is a good index.

This book would be a desirable one for Nature Study, Biology, and Entomology reference libraries.

M. A. RUSSELL.

CURTIS, CARLTON C. *A Guide to the Trees.* Greenberg Publishers, New York. 201 pp. 1941. $1.50.

The first few pages of the book give a general key to the trees of northern United States east of the Rockies. Leaves are used as the main basis of the key. The remainder of the book gives keys to the species, and descriptions of each species. Most of these descriptions are accompanied by drawings of the leaf, flower, and fruit.

The book seems to be written mainly for the layman or the young person, the language is very simple and very few technical terms are used. The few terms that must be used are well explained in a section given to definitions. The reading matter is clear, concise, and easily read. An index gives both scientific and common names.

Physically, the book is of such a size that it can be carried on field trips. The paper and binding is of a nature that it should stand the treatment given a book on such trips. It would be very valuable either in the field or in the classroom.

H.A.S.

MACY, RALPH W., and SHEPARD, HAROLD H. *Butterflies: A handbook of the Butterflies of the United States, Complete for the Region North of the Potomac and Ohio Rivers and East of the Dakotas.* University of Minnesota Press, Minneapolis. 7 + 247 pp. 1941. $3.50.

Although intended primarily as a guide for proper identification, this book should stimulate observations and research in life histories and behavior as well. In the preliminary section there are thirty-five pages of general information about butterflies, in addition to the discussion and references for each species.

The authors outline points which should be recorded by observers who wish to contribute valuable facts on butterfly migration. And among other topics they discuss sense organs, color discrimination, and that strange process by which contact of butterfly wings to a photographic plate produces a latent image simi-

lar to that made by the usual exposure methods except that the light and dark areas are just reversed.

While such topics are interesting reading, their chief value is that they suggest class activities for field and laboratory. The book may at first appear difficult to a beginner because only twenty-nine of the 162 species are included in the fine color photographs. But the completeness of the keys should make it a standard identification guide throughout the area treated.

RICHARD F. TRUMP
Senior High School, Keokuk, Iowa.

WORTHINGTON, CATHERINE. *Upper and Lower Extremity and Innervation Charts.* Stanford University Press, Stanford University. 8 plates, 2 charts. 1941. $0.35.

These diagrams and charts will be helpful where human anatomy is offered to groups other than medical students, especially in various aspects of physical education including kinesiology and physical therapy techniques. The double page (folded) charts treat, respectively, the nerves from the brachial and pelvic plexi. Diagrams of muscles of the appendages are outlines only with origins and insertions shown as solid black areas against the outlines of skeletal elements. The sheets are perforated for insertion into a student's standard sized notebook.

JAMES M. SANDERS,
Chicago Teachers College.

STEVENSON, ELMO N. *Nature Games Book.* Greenberg Publishers, New York. 208 pp. 1941. $2.00.

This handbook will be found useful by teachers, camp counselors, scout leaders, and others who are charged with directing the recreation of children. The hundreds of games described are selected primarily for students of elementary grades, although some of them are adapted to high school boys and girls. The games are classified into those about animals, birds, flowers, leaves, special senses, stars, trails, trees, and miscellaneous. Many of them are illustrated with photographs. There is a bibliography and an index. The pocket-size and flexible, waterproof binding make this book practical for field work.

E.C.C.

Biology Teaching in the United States: Community Backgrounds and School Organizations: Data from a Questionnaire

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A fifth segment of the results obtained from a questionnaire circulated by the Committee on the Teaching of Biological Science is presented in the following pages. Other segments of this report have been published in THE AMERICAN BIOLOGY TEACHER.

COMMUNITY BACKGROUND

Distribution of replies. The 2,910 replies received in response to this part of the inquiry were classified according to types of communities, as shown in Table 1.

TABLE 1

Types of communities represented in replies

Type of community	Numbers	Percentages
Rural (less than 2,000)	1,009	34.7
Towns (2,000–10,000)	761	26.2
Small cities (10,000–100,000)	575	19.5
Large cities (over 100,000)	565	19.1

Replies from public schools of 9 "spe-

cial'' large cities were treated separately in many of the tabulations. These cities, with the number of replies received from each, are listed in Table 2.

TABLE 2

Number of replies from nine ''special'' large cities

New York City	90	Detroit	14
Philadelphia	13	Milwaukee	11
Washington, D. C.	14	Chicago	53
Minneapolis	6	Seattle	6
St. Louis	8		

The numbers and percentages of schools (replies) in each of the four community types are distributed in Table 3 according to geographical regions. Duplication of replies from the same school is here disregarded.

TABLE 3

Regional distribution of high schools (replies) according to types of communities

	Rural	Town	Small city	Large city
New England (155)	28 (18.0%)	36 (23.2%)	58 (38.7%)	33 (21.3%)
Middle Atlantic (667)	140 (21.0%)	209 (31.3%)	132 (20.0%)	186 (27.9%)
Southern (363)	156 (43.0%)	111 (30.0%)	59 (16.2%)	37 (10.2%)
Central (1,343)	556 (40.8%)	304 (22.6%)	253 (18.8%)	230 (17.1%)
Western (372)	129 (34.7%)	101 (26.9%)	73 (19.6%)	69 (18.6%)

Replies were received from public, parochial and private schools distributed as follows: public, 2,903; parochial, 99; private, 184.

The Parent-Teacher Associations. The first part of a question inquired as to the presence or absence of parent-teacher associations in the various communities. The total number of replies received was 2,911. Over 68% of the schools reporting have parent-teacher associations (1,993 as against 918 that had no such organizations).

The second part of the same question invited the biology teachers to state whether, from the standpoint of science teaching, they considered such associations, where present, as helpful, harmful, or indifferent. Presumably there is no *a priori* reason for assuming that an association of parents would be either hostile to the interests of the children or of the schools, or else indifferent. The purpose of this question was to get the judgment of the teachers as to the effectiveness of the pressure groups in furthering or obstructing the development of science in the curriculum. Accordingly the replies have been classified in Table 4 to show both the relative number of schools having such organizations in the various types of communities and in the different regions, etc.; and the number in each group judged to be ''helpful,'' ''harmful,'' or ''indifferent.''

The information regarding the parent-teacher associations is unsatisfactory because the returns are not complete, and also because in so many cases teachers answered one part of the question only. The result is that in some cases the number of associations that are characterized as ''helpful, harmful, or indifferent'' exceeds the total number of associations reported. In general, however, the figures indicate a great variation in the number and influence of such parent associations. The percentage of schools or systems having Associations, for all schools reporting, is 68.5%. The percentage varies from 51.2 in the rural schools to 88.0% in large cities. The figures for all cities (as against towns and rural) run above 80%. Such variation is to be expected since it is preeminently the urbanization of our lives

TABLE 4

Presence and value of parent-teacher associations

Kinds of schools	Number replies	Having P–T Assn.		Helpful	Harmful	Indifferent	Not having P–T Assn.
		Number	Per cent				
Total reporting	2,911	1,993	68.5	589	32	1,426	918
Towns	665	454	68.3	127	16	333	211
Rural	942	487	51.2	153	10	38	455
Cities							
Total large	504	442	88.0	129	3	296	62
Special large	237	196	82.7	64	1	127	127
Small cities	570	457	80.0	121	3	340	113
Public	2,701	1,860	68.9	530	32	1,354	841
Parochial	84	48	57.1	18	......	30	36
Private	126	85	67.5	41	......	42	41
Regional (Public schools only)							
New England	154	93	60.0	25	1	71	61
Middle Atlantic	578	433	76.6	118	5	304	145
Southern	349	273	79.6	88	10	177	76
Central	1,259	805	63.9	223	9	625	454
Western	361	256	70.9	76	9	177	105

that gives occasion for new organizations of men and women for new purposes, and specifically for purposes related to the home's most distinctive auxiliary, namely the school.

The difference between public schools and parochial schools (respectively 68.9% and 57.1%) is clear enough, but probably not significant: for, the number of parochial schools reporting is small, and in the parochial school, as in the rural school, the need for special parental organizations would appear rather later than in urban public schools. The private schools, also small in numbers, approach the general average with 67.5% having a parental organization. This is in part due to the fact that private schools generally serve urban families, and in part no doubt to the greater self-consciousness with respect to their children's schooling that characterizes the patrons of private schools.

In contrast to the urban-rural and public-private differentials, we find a rather surprising variation when we compare the different regions. New England shows the smallest proportion of schools with parental associations (60.0%) and the Southern states the highest percentage (79.6%). This is difficult to explain. The only interpretation suggested by the figures is the possibility that in many New England school communities the apparent complacency or inertia reflects a long history of public schools, which come to be taken for granted, whereas in the Southern states, the expansion of schooling came, after a long lag, at a time when there is greater public awareness of or concern with what our institutions are doing to our children. This hypothesis is supported by the fact that the Southern schools show the lowest percentage, 64.9% (177 out of 273), of "indifferent" associations while the New England reports show almost the highest percentage of "indifferent" parent-associations, 76.3% (71 out of 93). The Central states gave 77.4% (625 out of 805).

Waiving the criteria by which teachers judge the parental organizations to be harmful or helpful, we may assume that "indifference" is fairly inferred from mere inactivity, or from the incidence of

the organizations' concerns. Of the total of 2,047 reporting a judgment as to the helpfulness or harmfulness of the parental associations 589 (28.7%), found them helpful, 32 (1.5%) harmful, and 1,426 (69.0%) indifferent. The public schools, as distinguished from parochial and private, show almost exactly the same percentage of 'helpful'' associations—27.6% (530 out of 1,916). This is to be expected because of their preponderance in the returns and in the country. But although the numbers of the other schools are small, it is significant that 37.5% of the parochial school parent-associations and 49.4% of those conected with private schools are rated as helpful. Regionally, the Southern states have the largest percentage of ''helpful'' associations (32.0%) and the New England states the smallest percentage (25.0%).

The associations rated as ''harmful'' are found in towns to the greatest extent (3.3%); and to the least extent in the ''special'' largest cities (0.5%).

The large cities have both a high proportion of schools with parent-teacher associations (88.0%) and also at least an average percentage of ''helpful'' associations (30.0%). But parents in the largest cities are probably too diversified to form effective pressure groups with unitary purposes. It is possible too that the variation in the percentage of ''harmful'' associations indicates a general improvement in the disposition of the adult population to leave technical educational matters to the school people, instead of trying to tell the teachers too specifically what they should or should not do.

(To be continued next month.)

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